RESOURCE NOTES

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Ground Cover Dynamics in a Sagebrush Steppe Community

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Background

The Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, operated the Stratton Sagebrush Study Area in southcentral Wyoming from 1967 to 1991 in cooperation with BLM. Past research at Stratton produced abundant new knowledge about sagebrush steppe ecology and hydrology. Of particular interest is a set of ground cover data collected from 1968 to 1981 (Sturges, 1986). Long-term data sets such as this one are rare and can be very valuable tools for land managers dealing with current resource management issues. For example, long-term ground cover data may reveal important information about the variability of different cover parameters under relatively constant land-use situations.

The Stratton site is located about 30km west of Saratoga, Wyoming at an elevation of 2340 to 2370m. The area was grazed lightly to moderately by domestic sheep, antelope, and mule deer during its tenure as a study area. Average annual precipitation was 52.6cm, three-quarters of which was snow. The area is best described as late seral sagebrush steppe with mountain big sagebrush on deeper soils, Wyoming big sagebrush and black sage on shallower soils, and Idaho fescue, bluegrass, needlegrass, and sedge as understory species. Cushion plants are common on exposed ridgetops and summits. The average shrub canopy cover was 16 percent.

Discussion

Ground cover data were collected triennially, beginning in 1968 and ending in 1981, on the Loco Creek Watershed at Stratton (Sturges, 1986). Loco Creek was used as a control watershed for sagebrush eradication experiments. The ground cover data are portrayed in Figures 1 and 2. The present analysis is based on primary samples. Each primary sample consisted of 500 individual line-point observations read along five 100-ft transects, 100 observations per transect. The data were collected from mid-August to late September of each sampled year.

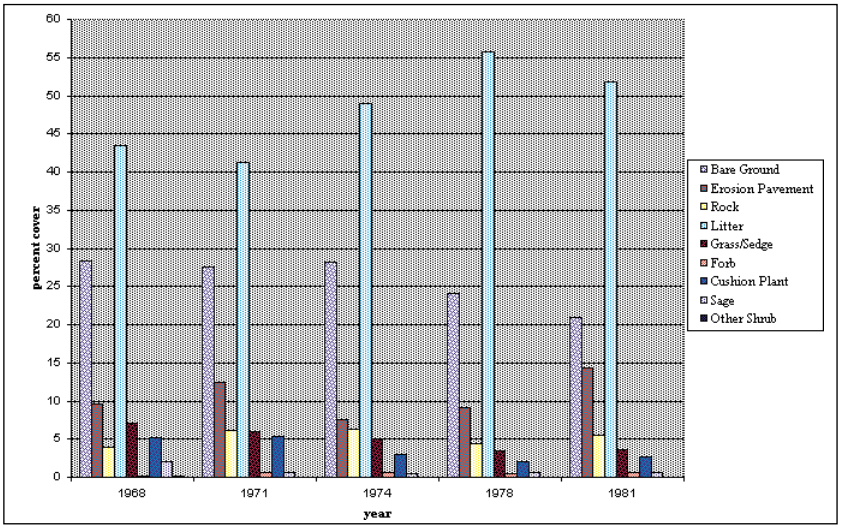

Figure 1. Average ground cover (%) data from Loco Creek Watershed.

The amount of bare ground present on a site is a reliable predictor of site stability (Packer, 1951). Although bare ground appeared to decline gradually between 1968 and 1981 on the Loco Creek Watershed, there was no statistically significant ($p=0.95$) difference between the two years. Similarly, no statistically-significant differences were found for the remainder of the ground cover components. In spite of a snowmold fungus that killed sagebrush on the Loco Creek watershed (Sturges, 1986), there was no significant difference in sagebrush canopy cover between 1968 and 1981.

Figure 1 shows the correlation coefficients among ground cover components and sagebrush canopy cover. The highly significant inverse correlation between bare ground and litter ($r=-0.83$) indicates that there are direct tradeoffs between litter and bare ground on this site. The same, but to a lesser extent, may be said about the relationship between bare ground and grass/sedge cover ($r=-0.53$).

The relationship between sagebrush canopy cover and bare ground appeared to change between 1968 and 1981 at Stratton. The slopes of the linear regression relationships between these two variables were nearly identical but the intercept (amount of bare ground when sagebrush canopy cover is 0) decreased from 47 percent (1968) to 34 percent (1981).

Conclusion

Hydrologic cover[1] provides a good index of site stability. It is inversely related to runoff potential, in that a high hydrologic cover value would indicate low runoff potential. According to Packer (1951), reduced cover (vegetation and litter) and large bare openings are indicative of low site stability and high erosion potential. Hydrologic cover was quite stable over the 14 years of observations, ranging from 58 to 62 percent, and exhibiting a coefficient of variation of 34 percent. By comparison, bare ground ranged from 21 to 28 percent, with a coefficient of variation of 43 percent. A strong inverse relationship (r = -0.82) existed between bare ground and hydrologic cover.

Litter was the largest component of hydrologic cover, contributing an average of 82 percent. The contribution of litter to hydrologic cover increased from 74 percent in 1968 to nearly 90 percent in 1978 and 1981. However, this increase was not statistically significant. There is a highly significant correlation between litter and sagebrush aerial cover. The litter derived from sagebrush canopies tends to be larger, does not oxidize as rapidly as litter from grasses, sedges, and forbs, and thus persists longer in the harsh environment found at the Stratton site. A linear regression analysis of the relationship between litter and sagebrush aerial cover showed that the relationship did not change over the measurement period.

Ground cover at Stratton was remarkably stable over the 14-year measurement period, in spite of a significant drought event during 1976-77. Hydrologic cover exhibited a low variability during the measurement period and should be evaluated further as a potential indicator of landscape stability and ecological condition.

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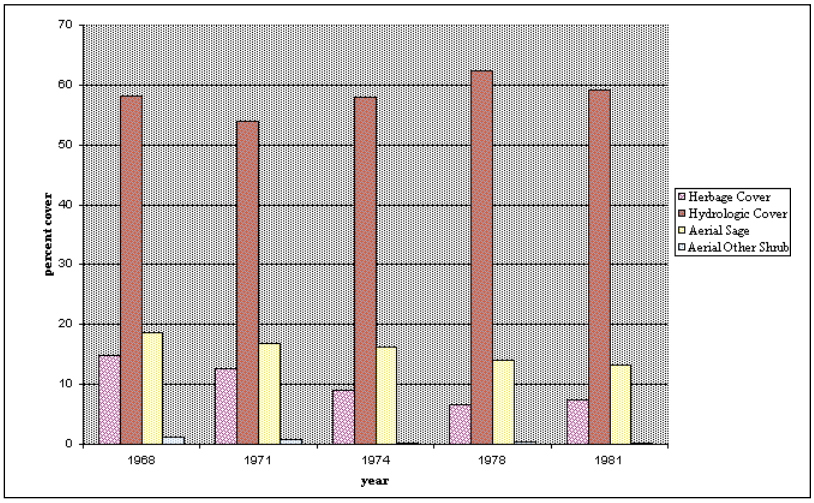

Figure 2. Aerial cover (%) data from Loco Creek Watershed.

[1]Hydrologic cover is defined here as the sum of litter, grass/sedge, forb, cushion plant, and shrub components of ground cover

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